

IGBT Modules

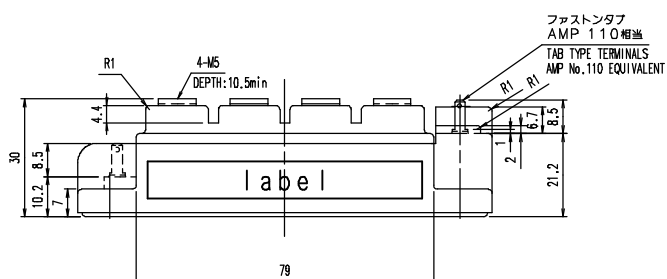
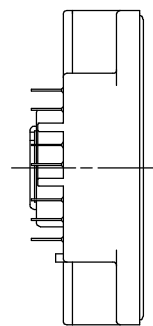
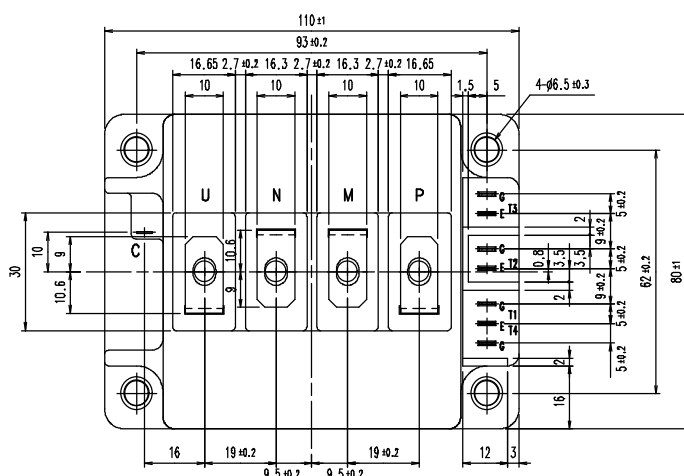
1200V/340A/IGBT, ±600V/340A/RB-IGBT, 4-in-1 package

Higher efficiency
Optimized Advanced T-type circuit
Low inductance module structure

Inverter for motor drive
Uninterruptible powere supply
Power conditioner

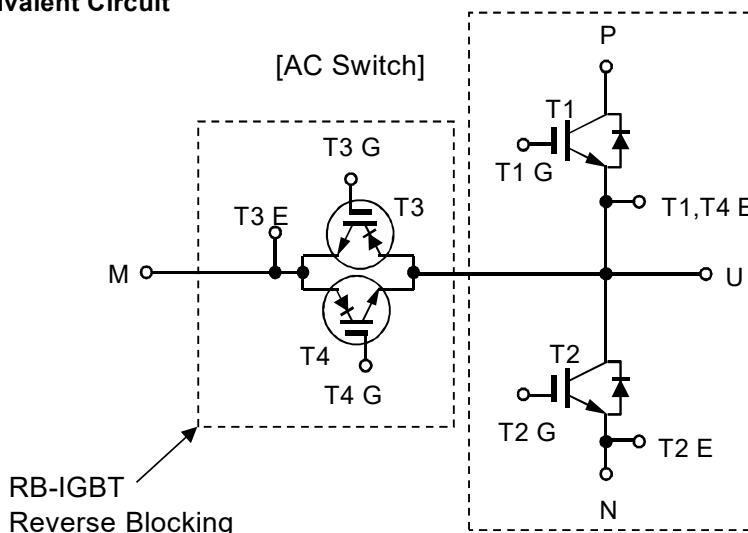


(Unit : mm)



Weight: 460g (typ.)

[Inverter]



4MBI340VF-120R-50

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■ Absolute Maximum Ratings (at $T_c = 25^\circ\text{C}$ unless otherwise specified)

Item		Symbol	Condition		Maximum Rating	Unit
Inverter	Collector-Emitter voltage	V_{CES}			1200	V
	Gate-Emitter voltage	V_{GES}			± 20	V
	Collector current	I_C	Continuous	$T_c = 80^\circ\text{C}$	340	A
			I_C pulse	1ms	600	
		$-I_C$			340	
					600	
	Collector power dissipation	P_C	1 device		1500	W
	Junction temperature	T_{vj}			175	$^\circ\text{C}$
	Operating temperature (under switching conditions)	T_{vjop}			150	
	Case temperature	T_c			125	$^\circ\text{C}$
AC Switch	Collector-Emitter voltage	V_{CES}			± 600	V
	Gate-Emitter voltage	V_{GES}			± 20	V
	Collector current	I_C	Continuous	$T_c = 80^\circ\text{C}$	340	A
		I_C pulse	1ms	$T_c = 80^\circ\text{C}$	600	
	Collector power dissipation	P_C	1 device		1500	W
	Junction temperature	T_{vj}			150	$^\circ\text{C}$
	Operating temperature (under switching conditions)	T_{vjop}			125	
	Storage temperature	T_{stg}			$-40 \sim +125$	$^\circ\text{C}$
	Isolation voltage	V_{iso}	AC : 1min.		2500	
	Screw torque	-	M5 or M6		3.5	Nm
		-	M5		3.5	

(*1) All terminals should be connected together during the test.

(*2) Recommendable value : 2.5-3.5 Nm (M5 or M6)

(*3) Recommendable value : 2.5-3.5 Nm (M5)

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■ Electrical characteristics (at $T_{vj}=25^{\circ}\text{C}$ unless otherwise specified)

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Inverter	Zero gate voltage collector current	I_{CES} $V_{GE}=0\text{V}$ $V_{CE}=1200\text{V}$	-	-	2.0	mA
	Gate-Emitter leakage current	I_{GES} $V_{GE}=0\text{V}$ $V_{GE}=\pm 20\text{V}$	-	-	400	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$ $V_{CE}=20\text{V}$ $I_C=300\text{mA}$	6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (chip) $V_{GE}=15\text{V}$ $I_C=300\text{A}$	$T_{vj}=25^{\circ}\text{C}$	1.85	2.10	V
			$T_{vj}=125^{\circ}\text{C}$	2.20	-	
			$T_{vj}=150^{\circ}\text{C}$	2.25	-	
		$V_{CE(sat)}$ (terminal) $V_{GE}=15\text{V}$ $I_C=300\text{A}$	$T_{vj}=25^{\circ}\text{C}$	2.05	2.35	
			$T_{vj}=125^{\circ}\text{C}$	2.40	-	
			$T_{vj}=150^{\circ}\text{C}$	2.45	-	
	Internal gate resistance	r_g -	-	2.50	-	Ω
	Input capacitance	C_{ies} $V_{CE}=10\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	-	25.2	-	nF
	Turn-on time	SW mode : A $V_{cc}=400\text{V}$ $I_C=300\text{A}$	t_{on}	0.75	1.30	μs
			t_r	0.45	0.80	
			$t_{r(l)}$	0.15	-	
	Turn-off time	$V_{GE}=\pm 15\text{V}$ $R_G=+10/-1\Omega$	t_{off}	0.60	1.00	μs
			t_f	0.10	0.35	
	Forward on voltage	V_F (chip) $I_F=300\text{A}$	$T_{vj}=25^{\circ}\text{C}$	1.70	1.95	V
			$T_{vj}=125^{\circ}\text{C}$	1.85	-	
			$T_{vj}=150^{\circ}\text{C}$	1.80	-	
		V_F (terminal) $I_F=300\text{A}$	$T_{vj}=25^{\circ}\text{C}$	1.95	2.25	
			$T_{vj}=125^{\circ}\text{C}$	2.10	-	
	Reverse recovery time	SW mode : B $V_{cc}=400\text{V}$ $V_{GE}=\pm 15\text{V}$ $I_F=300\text{A}$ $R_G=+8.2/-39\Omega$	$T_{vj}=150^{\circ}\text{C}$	2.05	-	
			-	-	0.3	μs
AC Switch	Zero gate voltage collector current	I_{CES} $V_{GE}=0\text{V}$ $V_{CE}=600\text{V}$	-	-	3.0	mA
	Gate-Emitter leakage current	I_{GES} $V_{GE}=0\text{V}$ $V_{GE}=\pm 20\text{V}$	-	-	600	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$ $V_{CE}=20\text{V}$ $I_C=300\text{mA}$	5.5	6.5	7.5	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (chip) $V_{GE}=15\text{V}$ $I_C=300\text{A}$	$T_{vj}=25^{\circ}\text{C}$	2.45	2.80	V
			$T_{vj}=125^{\circ}\text{C}$	2.60	-	
		$V_{CE(sat)}$ (terminal) $V_{GE}=15\text{V}$ $I_C=300\text{A}$	$T_{vj}=25^{\circ}\text{C}$	2.55	2.95	
			$T_{vj}=125^{\circ}\text{C}$	2.70	-	
	Internal gate resistance	r_g -	-	2.93	-	Ω
	Input capacitance	C_{ies} $V_{CE}=10\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	-	0.5	1.05	nF
	Turn-on time	SW mode : B $V_{cc}=400\text{V}$ $I_C=300\text{A}$	t_{on}	0.27	0.53	μs
			t_r	0.12	-	
			$t_{r(l)}$	1.32	3.00	
	Turn-off time	$V_{GE}=\pm 15\text{V}$ $R_G=+8.2/-39\Omega$	t_{off}	0.11	0.35	μs
			t_f	0.05	-	
	Reverse recovery time	SW mode : A $V_{cc}=400\text{V}$ $V_{GE}=\pm 15\text{V}$ $I_C=300\text{A}$ $R_G=+10/-1\Omega$	-	-	0.3	μs
	Internal inductance	L P-N	-	40	-	nH
		P-M	-	33	-	
		M-N	-	33	-	

■ Thermal resistance characteristics

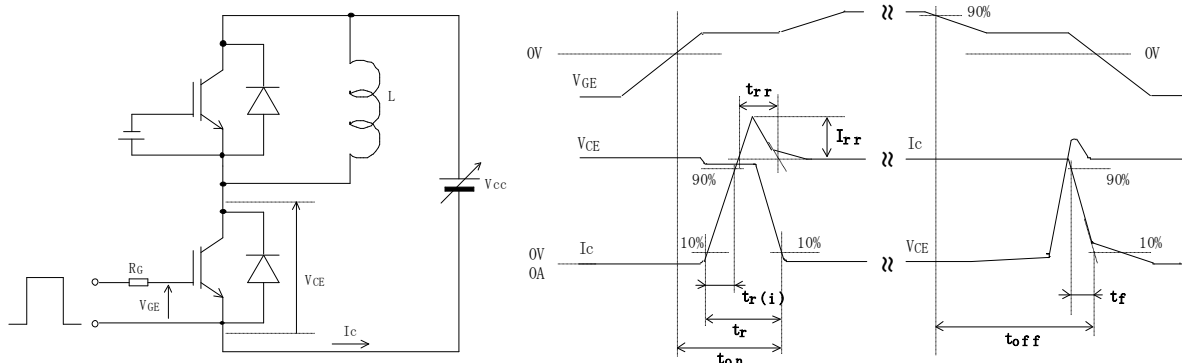
Item	Symbol	Condition	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	T1, T2 IGBT	-	-	0.075	$^{\circ}\text{C/W}$
		T1, T2 FWD	-	-	0.112	
		T3, T4 RB-IGBT	-	-	0.084	
Contact thermal resistance (1device) (*1)	$R_{th(c-f)}$	T1, T2	-	0.025	-	
		T3, T4 with thermal compound	-	0.017	-	

(*1) This is the value which is defined mounting on the additional cooling fin with thermal compound.

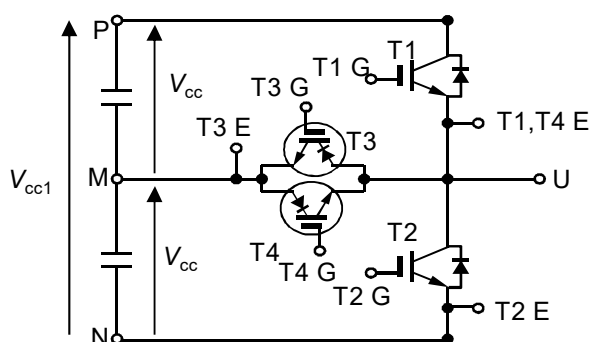
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■ Definitions of switching time



■ Definitions of switching mode



SW mode	Load L	T1	T2	T3	T4
A	M-U	SW	OFF	OFF	ON
	M-U	OFF	SW	ON	OFF
B	P-U	OFF	OFF	SW	ON
	U-N	OFF	OFF	ON	SW

SW: Connect to drive circuit and input gate signal

ON: Bias voltage of gate +15V

OFF: Reverse bias voltage of gate -15V

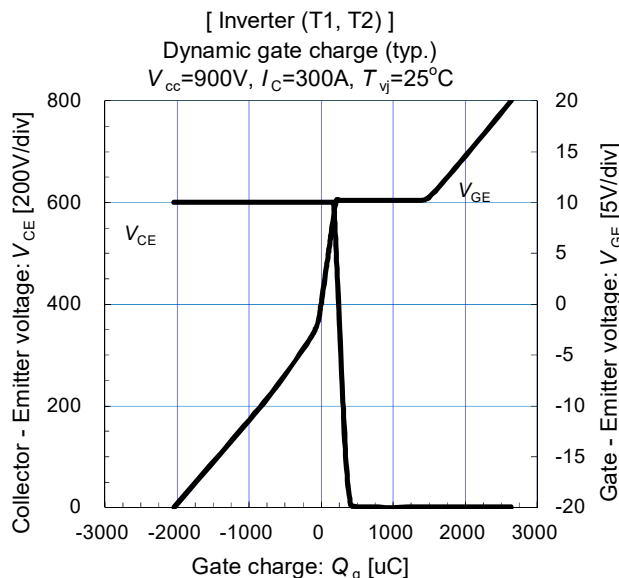
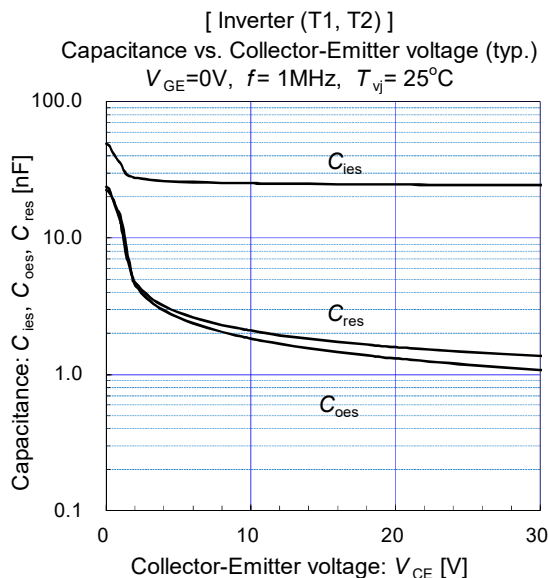
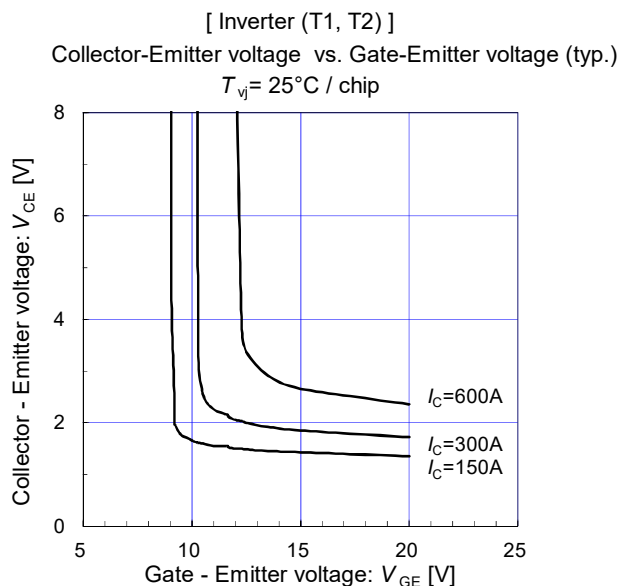
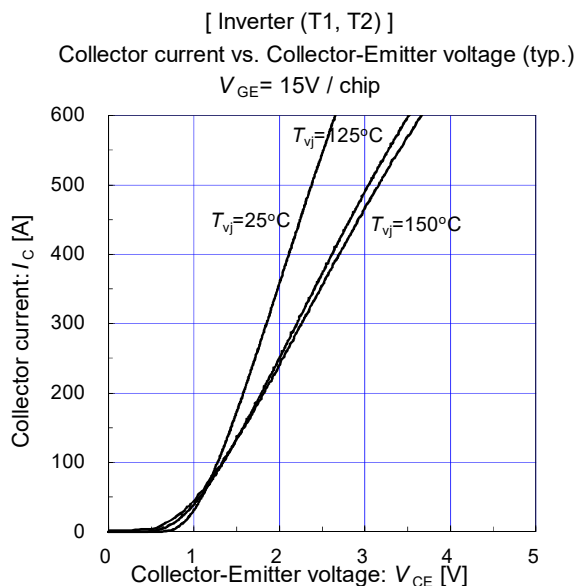
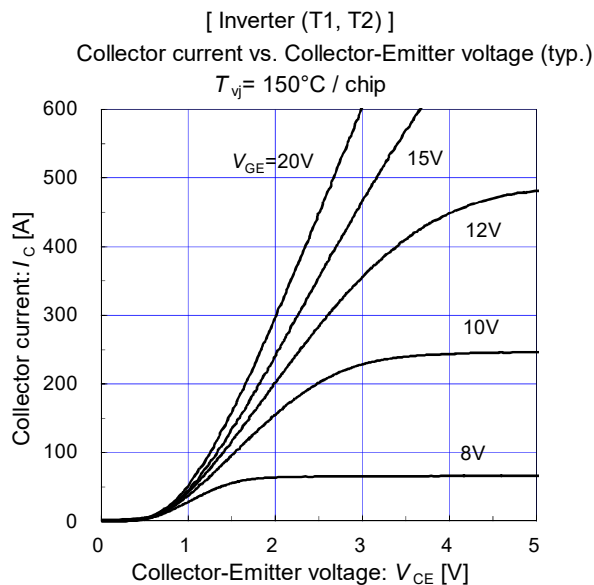
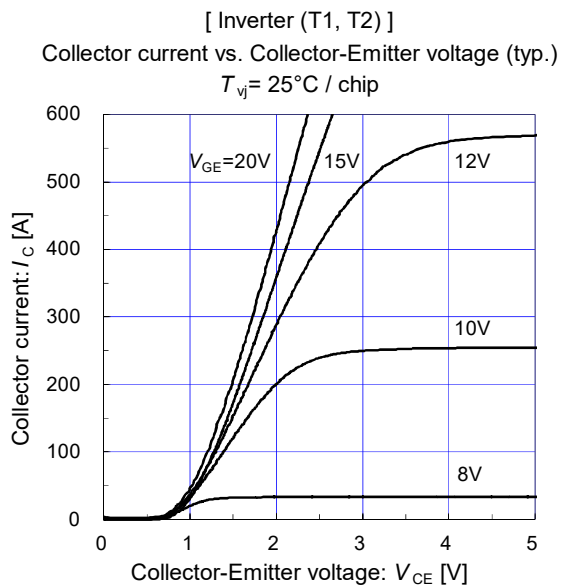
$V_{cc1} = 2 \times V_{cc}$

Warning

When reverse voltage is applied to C-E of RB-IGBT without forward gate bias voltage (+VGE), the reverse leakage current at C-E will be large. In order to reduce the reverse leakage current, +VGE should be applied to G-E of RB-IGBT when reverse voltage is being applied to C-E.
(Recommended value : +VGE=15V)

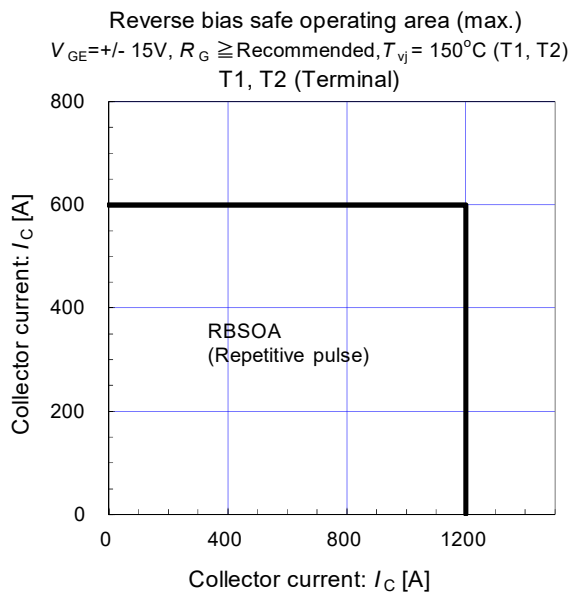
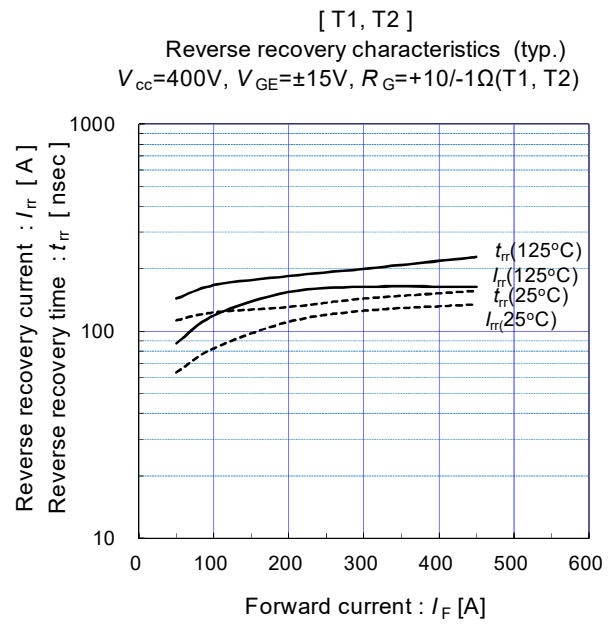
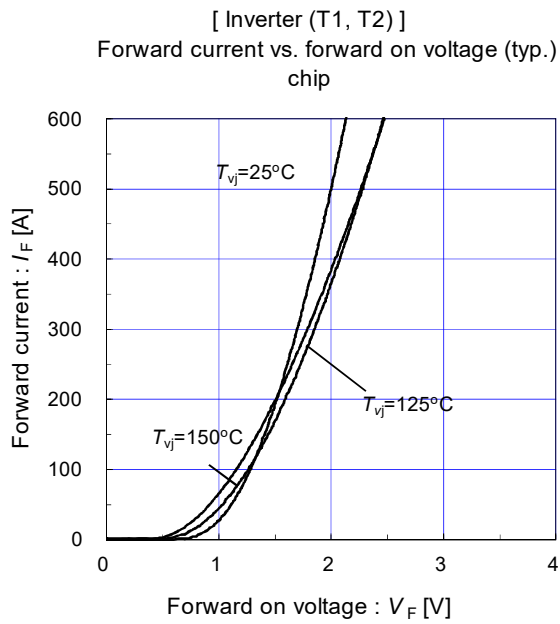
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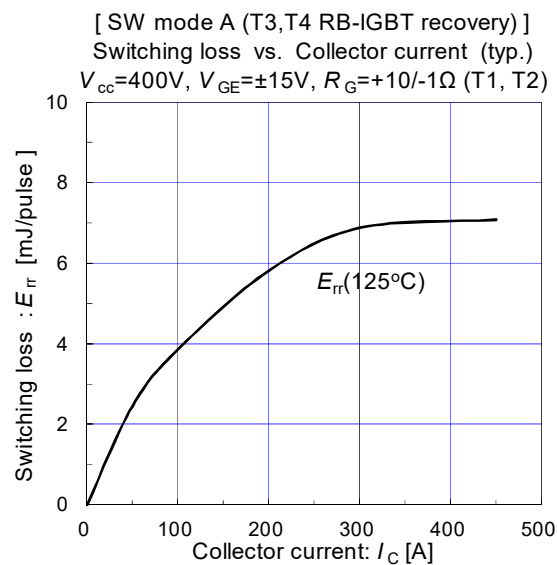
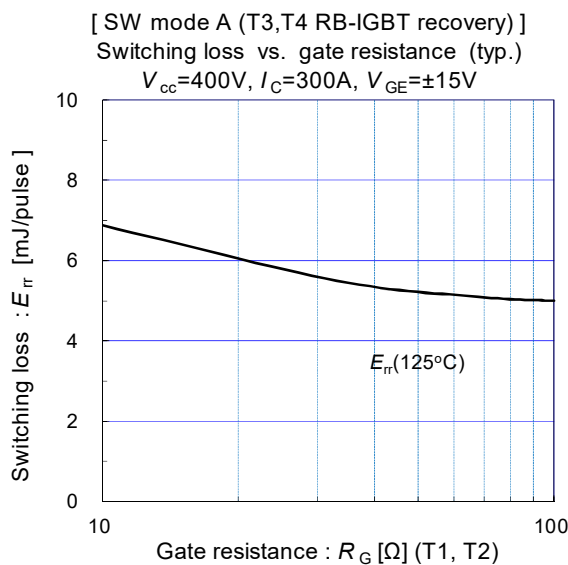
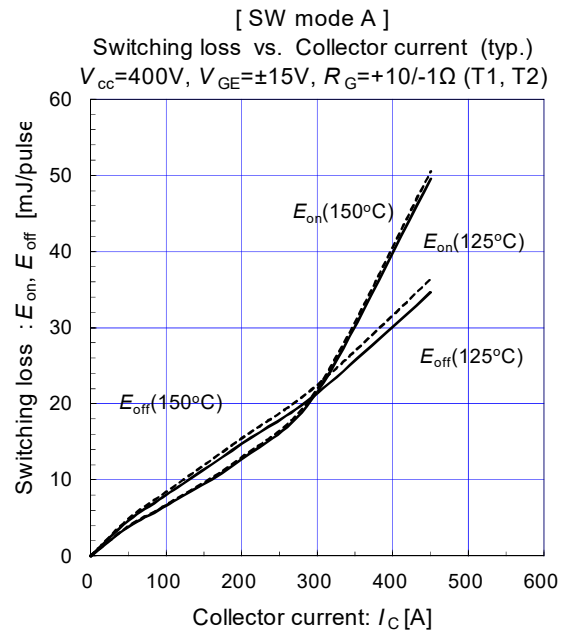
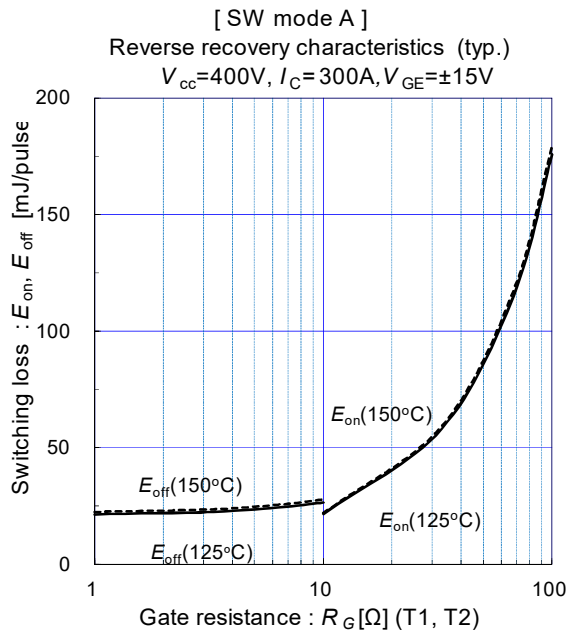
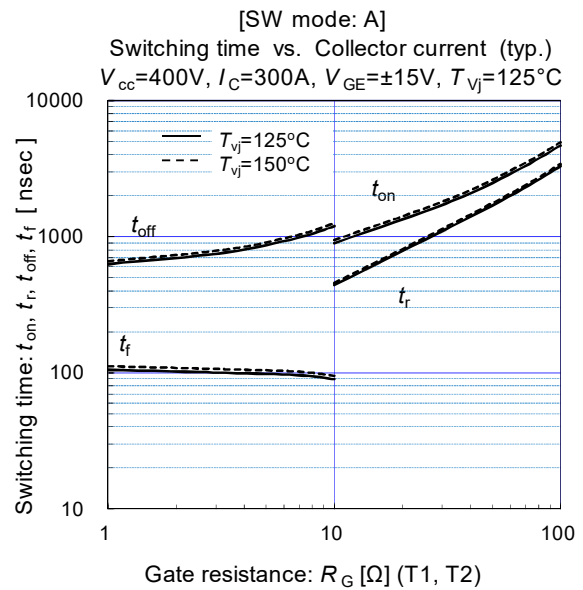
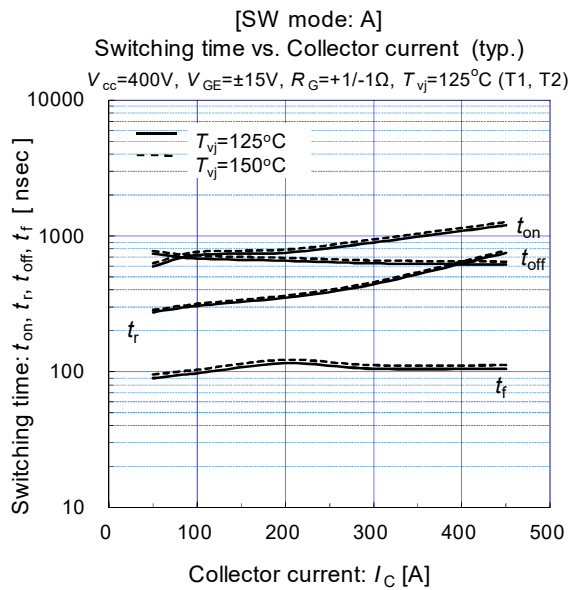
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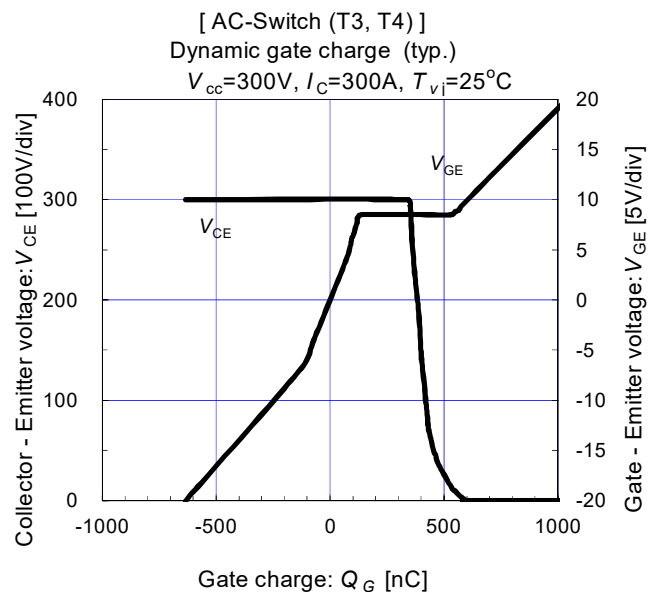
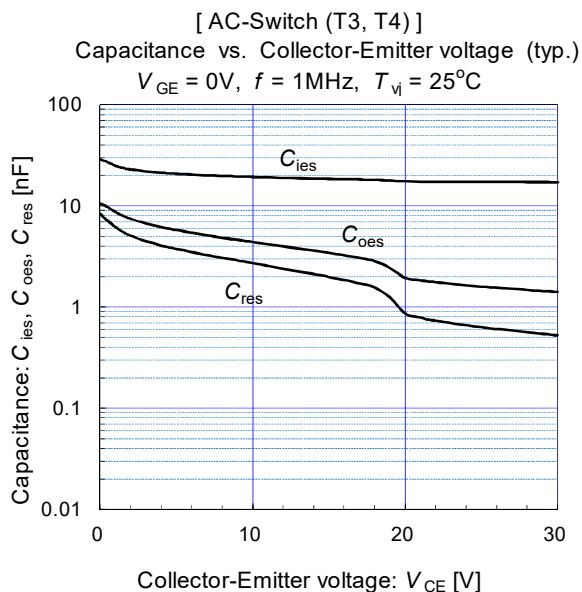
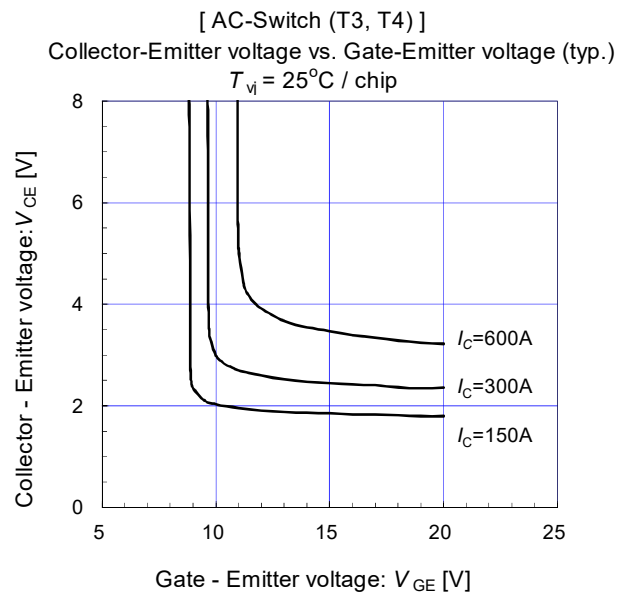
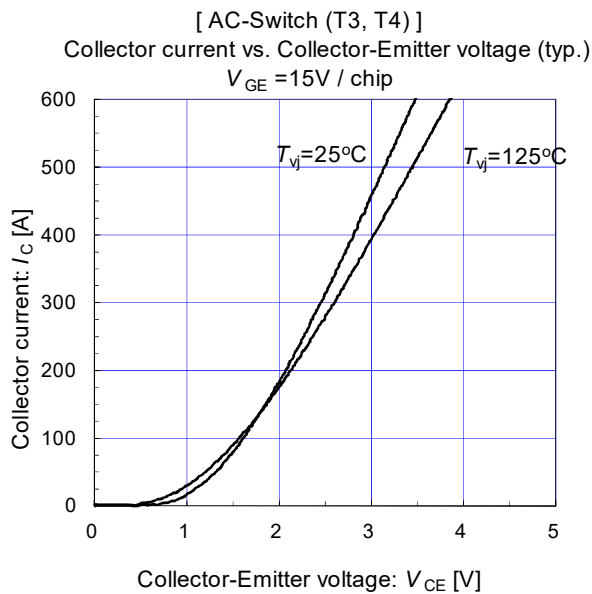
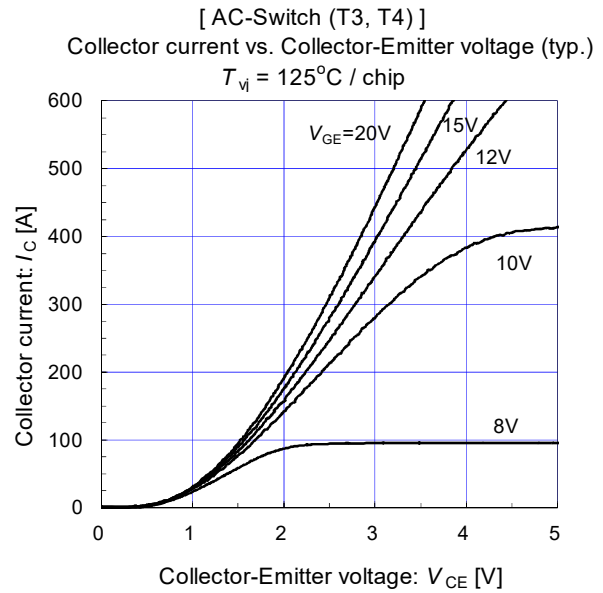
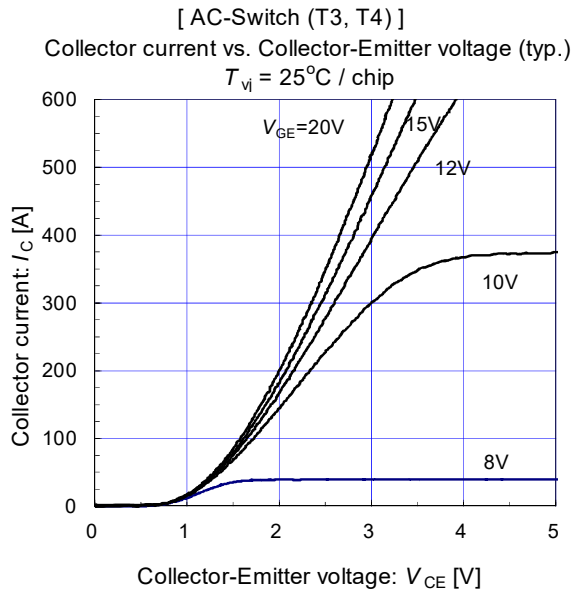
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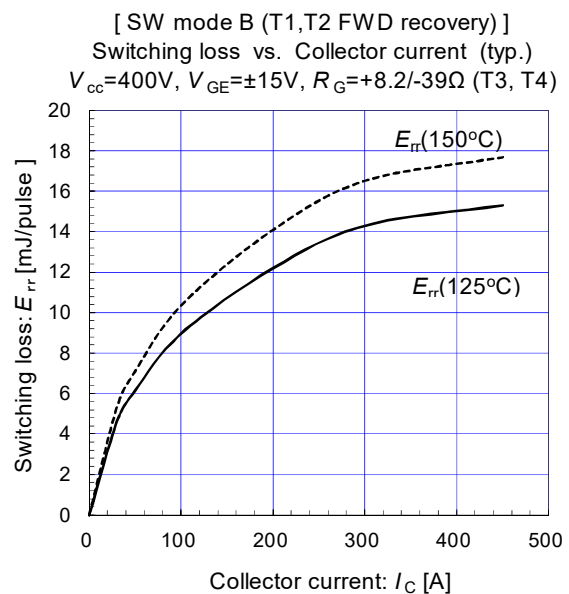
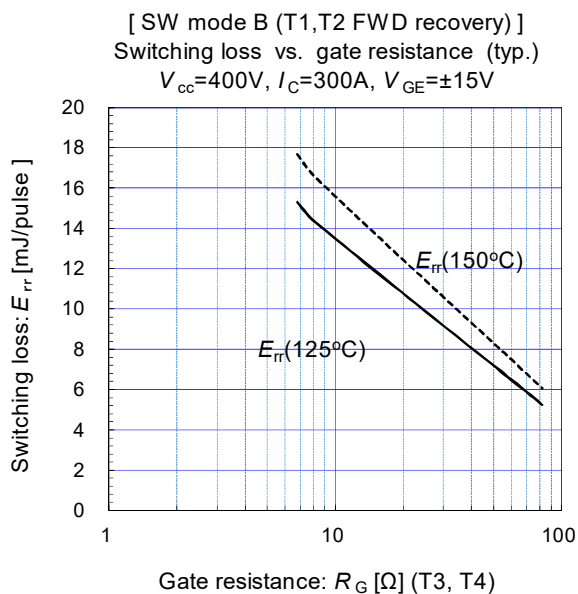
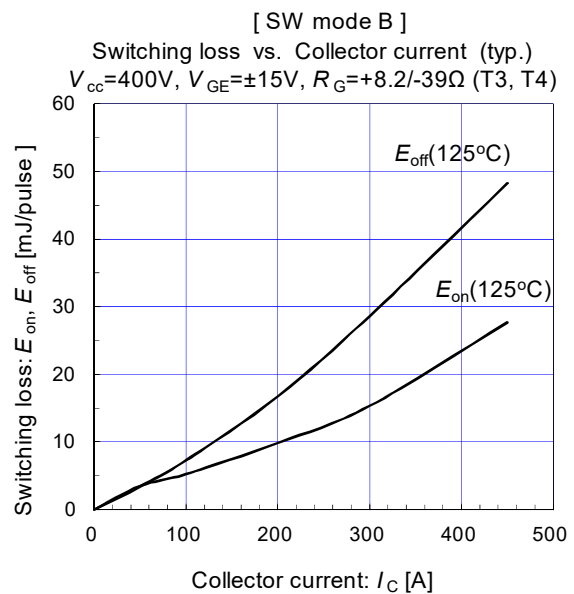
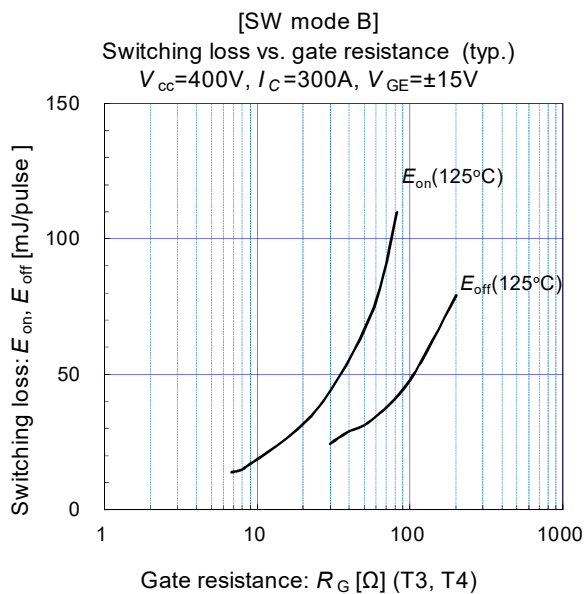
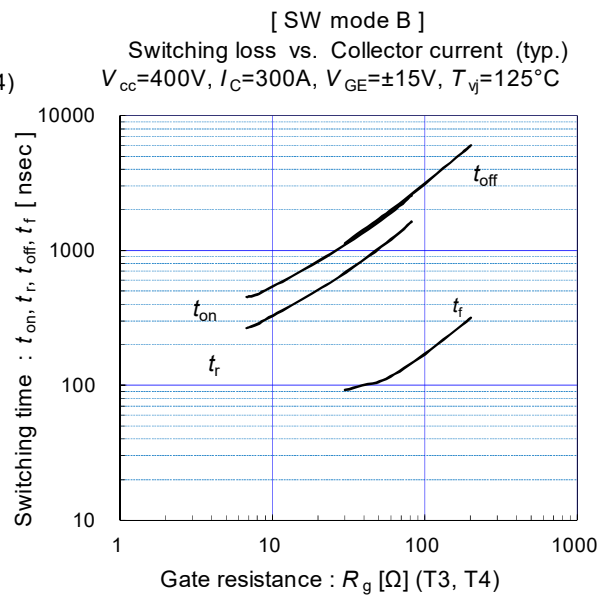
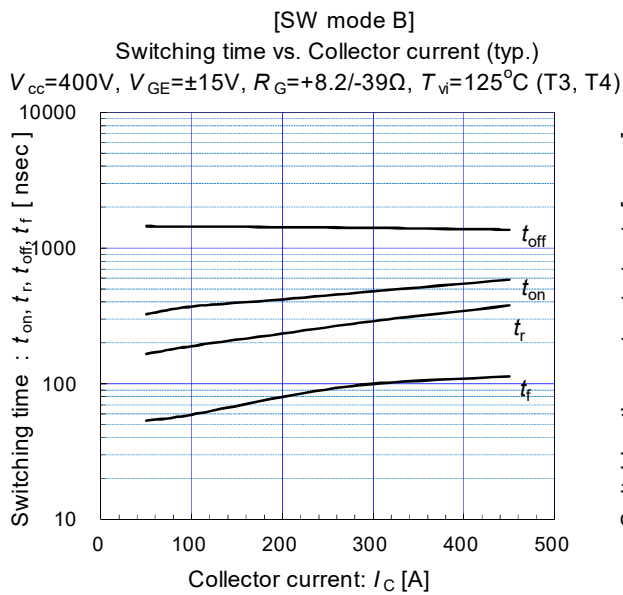
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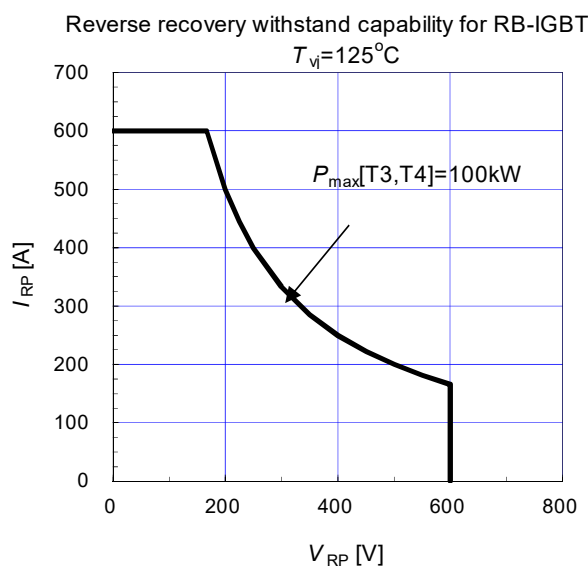
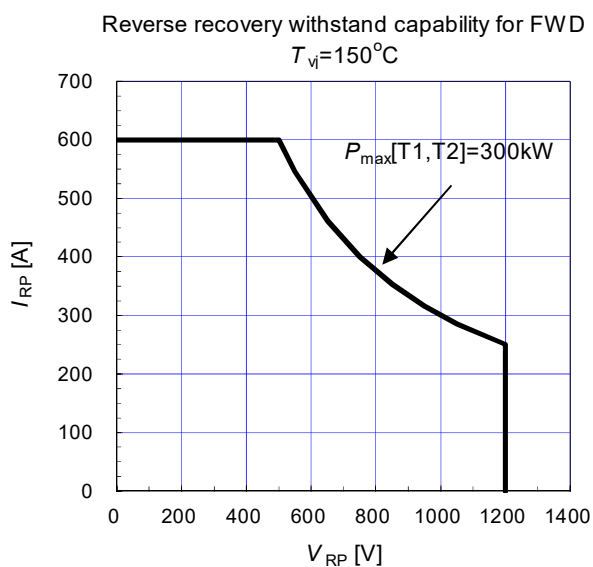
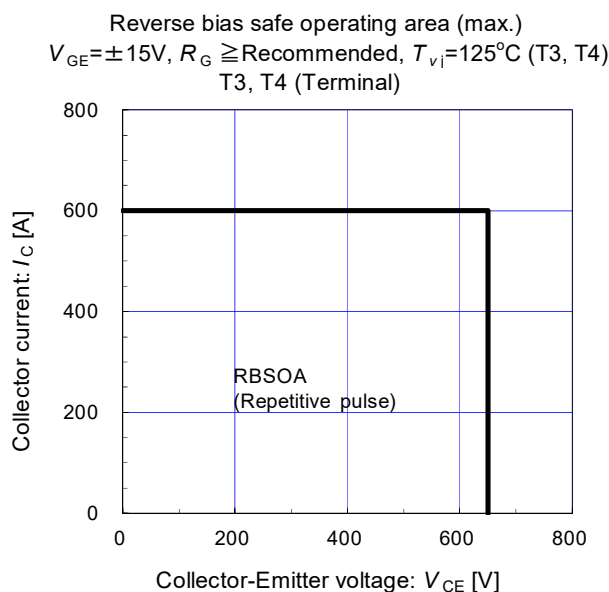
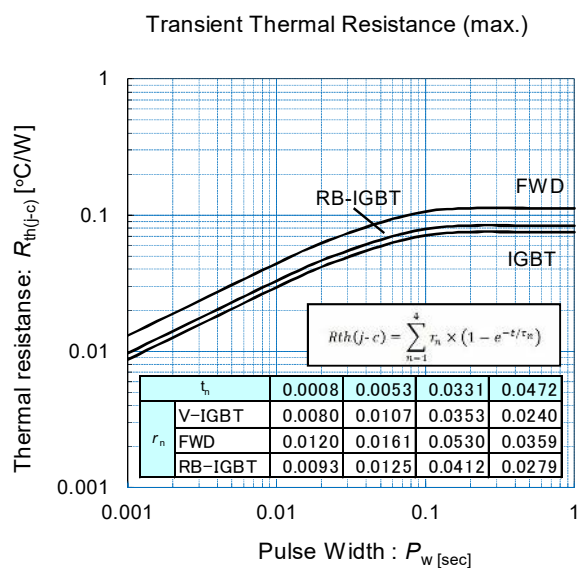
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